



Mittal, T., Atack, N., Williams, J., Puryer, J., Sandy, J., & Ireland, A. (2017). The aberrant second premolar. *Orthodontic Update*, 10, 96-101. <http://www.orthodontic-update.co.uk/issueArticle.asp?aKey=196>

Peer reviewed version

License (if available):
CC BY-NC

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via George Warman Publications at <http://www.orthodontic-update.co.uk/issueArticle.asp?ec=av+1&aKey=196>. Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available: <http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

Generic Heading: Orthodontics

Title: The Aberrant Second Premolar

Authors:

T Mittal

BDS, Specialty Registrar, Derriford Hospital, Plymouth

NE Attack

BDS, MSc, MOrth RCS, FDS RCS, Consultant Orthodontist, Musgrove Park Hospital, Taunton and School of Oral and Dental Sciences, University of Bristol

JC Williams

BDS, MSc, DDS, MOrth RCS, FGDP, Academic Clinical Lecturer in Orthodontics, School of Oral and Dental Sciences, University of Bristol

J Puryer

BDS, DPDS, FDS RCS(Eng), PGDip, FHEA, Clinical Lecturer in Restorative Dentistry, School of Oral and Dental Sciences, University of Bristol

JR Sandy

BDS, MSc, PhD, MOrth RCS, FDS RCS, FDS RCS(Ed), FFD RCS, Professor of Orthodontics and Dean of Health Sciences, University of Bristol

AJ Ireland

BDS, MSc, PhD, MOrth RCS, FDS RCS, FHEA Professor of Orthodontics, School of Oral and Dental Sciences, University of Bristol,

The Aberrant Second premolar

Abstract: Second premolars are one of the last successional teeth to erupt in the maxillary and mandibular arches. Early loss of primary teeth or first permanent molars can lead to disrupted eruption of these teeth. This article gives an overview of the possible aetiology and treatment of the aberrant second premolar.

Clinical Relevance: Awareness of the possible sequelae of unerupted second premolars is important in diagnosis and treatment planning.

Objectives statement: To inform the reader of possible aetiologies and treatment of the aberrant second premolar.

Introduction:

Second premolar teeth are one of the final successional teeth to erupt into the occlusion. Although they often erupt without incidence, this is not always the case. There is potential for unerupted second premolars to cause damage to adjacent teeth or migrate from their expected position. This paper presents a summary of second premolar formation and eruption and possible consequences of impaction.

Formation

The maxillary and mandibular second premolars begin to calcify between 24 and 30 months post-partum. They are often the last successional teeth to erupt, usually between the ages of 10 and 12 years in both the mandibular and maxillary arches and are preceded by the second primary molars. Following eruption of the premolars, which are narrower than their predecessors, there is a slight decrease in arch length as the 'E' space is closed by physiological mesial drift.

The premolar tooth germs develop apically to the roots of the primary second molars and are in close proximity to either the maxillary sinus or the mental foramen. As the teeth develop, the crowns often become positioned between the roots of the primary tooth (Figure 1). There is subsequent resorption of the primary tooth roots under the eruptive influence of the permanent tooth.



Figure 1- A sectional orthopantomogram (OPT) radiograph showing the premolars between the roots of the primary molars

1. The absent second premolar

Excluding third molars, the mandibular second premolar is the most common tooth to be developmentally absent, whilst the maxillary second premolar is the third most commonly missing¹. Literature specific to premolar teeth is limited, but the overall prevalence of missing second premolars is reported as approximately 2%².

Treatment in the case of absence

Treatment when the second premolar is absent will depend on the severity of the malocclusion, the presence of crowding, the condition and long-term prognosis of the retained second deciduous molar(s) and the wishes of the patient and the patient's family. Treatment planning must therefore be performed on a case-by-case basis. In some instances it may be advisable to maintain the primary tooth for as many years as possible, whereas in other cases it may be prudent to extract the primary tooth and either close the resultant space using orthodontics, or provide the patient with some form of prosthetic replacement. If the decision is made to retain the primary tooth it is possible for it to last into the fifth decade of life, even if there is some evidence of root resorption^{3, 4}.

2. The impacted second premolar

The lower second premolars are the third most commonly impacted tooth after the third molar and the maxillary permanent canine⁵. The most frequent cause for the impaction is premature loss of the primary predecessor and subsequent space loss by mesial movement of the first molar (Figure 2). In the lower arch the second premolar may either remain impacted within the line of the arch, or it may erupt

lingually. In the upper arch the same is true, but in this case the upper second premolar often erupts palatally.



Figure 2 – OPT radiograph showing early loss of the upper right second primary molar has led to impaction of the second premolar

Treatment in the case of impaction

Where there has been space loss following extraction of primary teeth, it is generally expected that the second premolar will erupt spontaneously on the lingual or palatal aspect of the arch. Where appropriate it can be removed with ease under local anaesthesia or alternatively space may be created orthodontically for its inclusion in the arch. Careful analysis and determination of the position and inclination of the tooth must be made radiographically, in order to assess whether the crown has indeed deflected out of the line of the arch. If space is created the tooth will often

erupt into a reasonable position, but very occasionally it will need to be exposed, bonded and then traction applied to bring it into the line of the arch (Figure 3).

If the premolar remains impacted in the line of the arch, there are potential risks associated with leaving it *in-situ*, principally a risk of resorption of the roots of the adjacent teeth.



Figure 3 Sufficient space has been created within the arch to bring the upper left second premolar into the line of the arch. However, in this case the tooth had to be exposed and bonded so that traction could be applied.

Risks of impaction – resorption to adjacent teeth

It is well known that unerupted maxillary canine teeth have the potential to resorb upper incisors in a large proportion of cases, should the crowns and roots be in close proximity⁶⁻⁸. This same risk applies to the unerupted second premolar. Should the tooth continue to erupt into the line of the arch, there is a significant risk of

resorption of the first premolar, the first permanent molar, or both. Howard (1978) described three cases of impacted, unerupted mandibular second premolars that had caused resorption of adjacent teeth. In all cases the impacted tooth erupted when the resorbed erupted tooth was extracted⁹. Tracey and Lee (1985) also reported on three cases of unerupted premolars causing extensive resorption of the adjacent first permanent molars, all of which subsequently required extraction¹⁰. They highlighted the importance of determining the bucco-lingual position of the unerupted second premolar in order to assess whether the tooth is likely to erupt or will remain impacted, in which case there is an increased risk of resorption of the roots of the adjacent teeth. Similarly in the upper arch, an unerupted maxillary second premolar can also lead to resorption of the roots of the first molar¹¹ and or first premolar. In the case of the patient illustrated in Figures 4-6, early loss of primary teeth due to caries, had led to space loss and subsequent buccal crowding of the upper permanent canines and impaction of the upper second premolars. The radiographs taken at the time show extensive root resorption of the upper left first permanent molar and first premolar (Figure 5). Extraction of these resorbing teeth permitted the second premolar to erupt into the line of the arch (Figure 6).



Figure 4 – Early loss of primary molars in this case led to buccal crowding of the upper permanent canines and impaction of the upper second premolars, which remain unerupted.

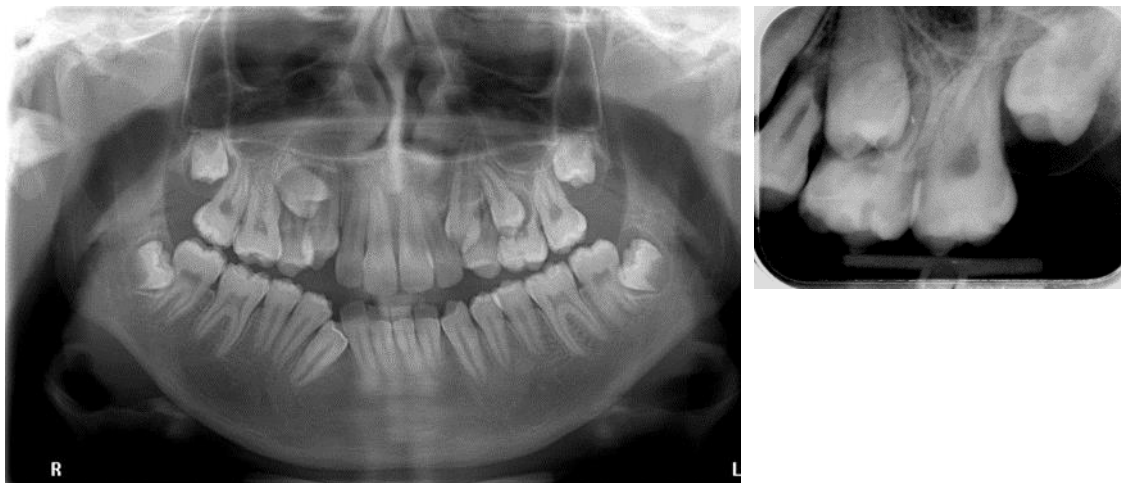


Figure 5 OPT and periapical radiographs of the patient in figure 4 showing extensive resorption of the roots of the upper left first premolar and first permanent molar



Figure 6 – Following the extraction of the resorbing first premolar and molar teeth, the upper second premolar erupted uneventfully.

3. The migrating second premolar

Early loss of the mandibular first permanent molar may result in distal migration of the mandibular second premolar, if the latter tooth escapes from between the roots of the second primary molar (Figure 7a and Figure 7b). In such cases, the distal impaction may self-correct, with the second premolar erupting mesially to the second molar without orthodontic intervention¹². However, it can prevent mesial movement of the second permanent molar into the first molar extraction space, so that when the second premolar erupts a large amount of space remains between the first and second premolars. Such a space can subsequently be difficult to manage (Figure 8).

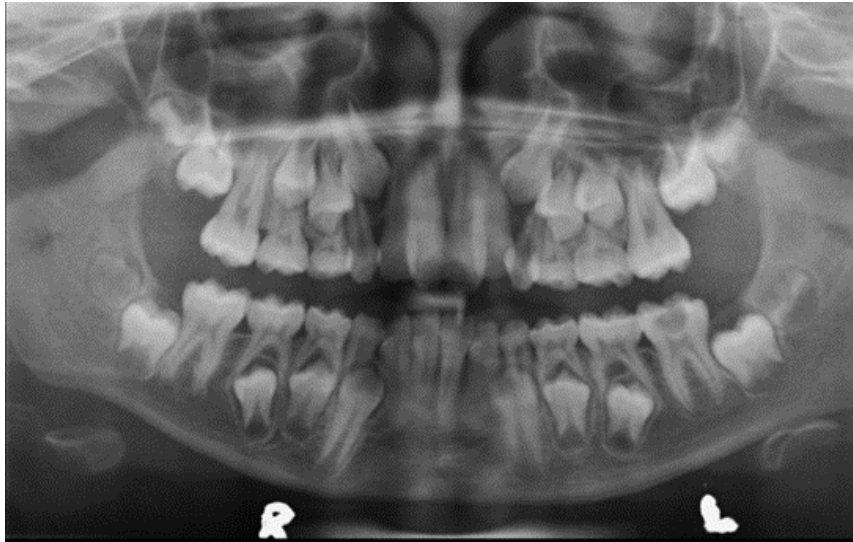


Figure 7a: OPT radiograph taken before extraction of the left first permanent molars in October 2011



Figure 7b: OPT radiograph taken December 2014, three years after the removal of the left first permanent molars. Notice how the lower left second premolar is erupting distal to the second primary molar.

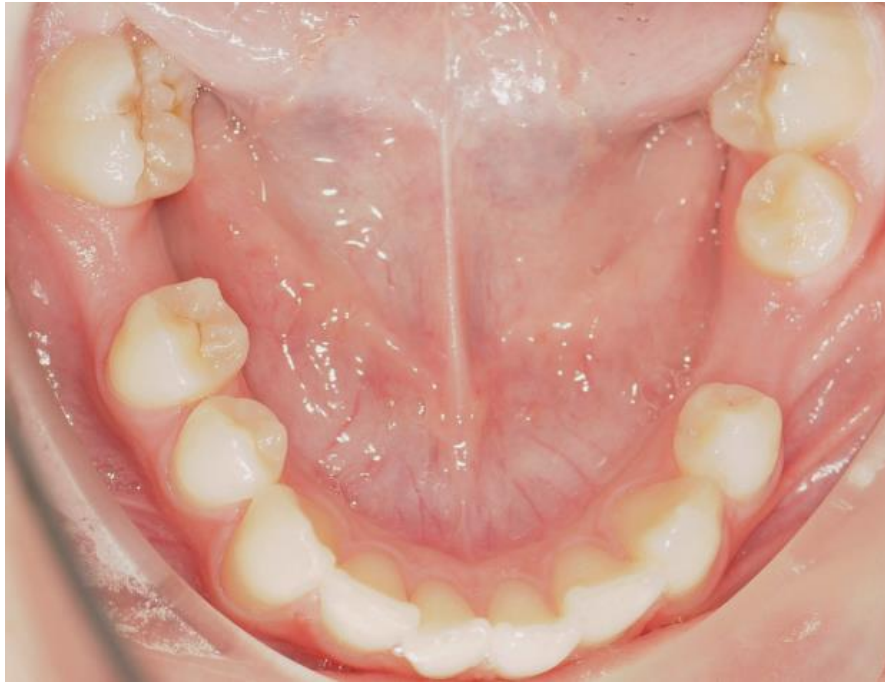


Figure 8 – In this case the lower left second premolar has drifted distally following the early loss of the first molar. The resulting space between the erupted premolars can be difficult to manage in the absence of much crowding

Although an ectopic path of migration can follow the early loss of primary predecessors or a first permanent molar as outlined, sometimes it occurs for no apparent reason other than perhaps an ectopically positioned second premolar tooth crypt. The degree of migration and the potential effects can be marked. In some instances the second premolar migrates sufficiently apical to the adjacent teeth that they escape resorption entirely (Figure 9). However, as with impacted canines, migrating second premolars can also lead to significant resorption of the roots of adjacent teeth. Figure 10 shows a periapical radiograph and a cone beam computed tomograph (CBCT) image of an unerupted upper second premolar migrating distally, leading to resorption of the upper first permanent molar.

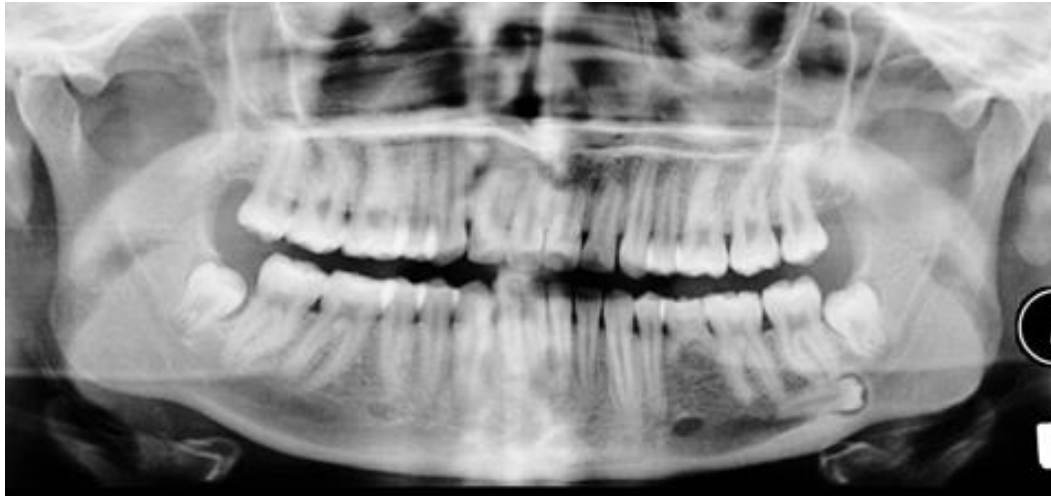


Figure 9 – OPT radiograph showing a case of a distally migrating lower second premolar that is sufficiently apical to avoid causing damage to the roots of the adjacent teeth



Figure 10 - A case of a migrating upper second premolar resorbing the roots of the upper first permanent molar on its route distally

Treatment in the case of the migrating second premolar

When a mandibular second premolar migrates distally, it will either self-correct when it meets the mesial aspect of the second molar or it may continue migrating

distally. The depth of the crown is an important factor in determining whether the second premolar will cause resorption of the adjacent tooth root or, if positioned apical to the root tip, continue its eruptive path along the body of the mandible⁹. Sutton (1968) reviewed 62 cases of distal migration of the unerupted second premolar and reported a case of a tooth migrating to the coronoid process¹³. Orton and MacDonald (1986) described a lower right mandibular second premolar continuing to migrate along the body of the mandible and into the ramus. The tooth might have continued to migrate into the coronoid process, but it was removed due to concerns that it might perforate the cortex¹⁴. Infante-Cossio *et al.* (2000) described a case where a patient attended with pain in the left angle of her mandible associated with an unerupted mandibular second premolar that had migrated and perforated the cortical bone, requiring a sagittal osteotomy to facilitate its removal¹⁵. Second premolars may migrate completely to the condyle or coronoid process^{16, 17}. Removal of these migrated teeth is indicated to protect bony anatomical structures, despite the complexity and risk of surgical intervention.

When a migrating second premolar is exposed and bonded, orthodontic treatment to bring an almost horizontal tooth into the arch can be a challenge, as considerable apical root movement is required. Figure 11 illustrates the pre-treatment position of an almost horizontal upper second premolar, which following exposure and bonding and the application of traction, erupted almost in the same horizontal position. Considerable effort was required to enable it to be uprighted (Figures 12a and b) and brought into the line of the arch.

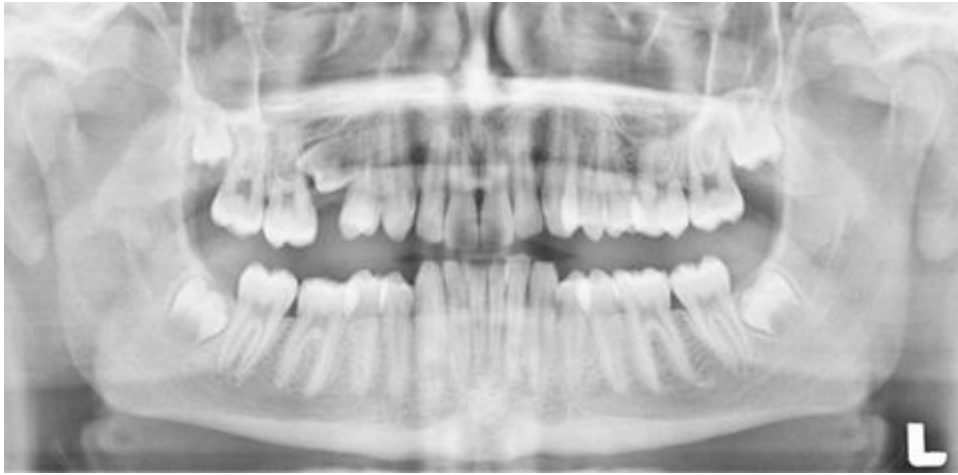
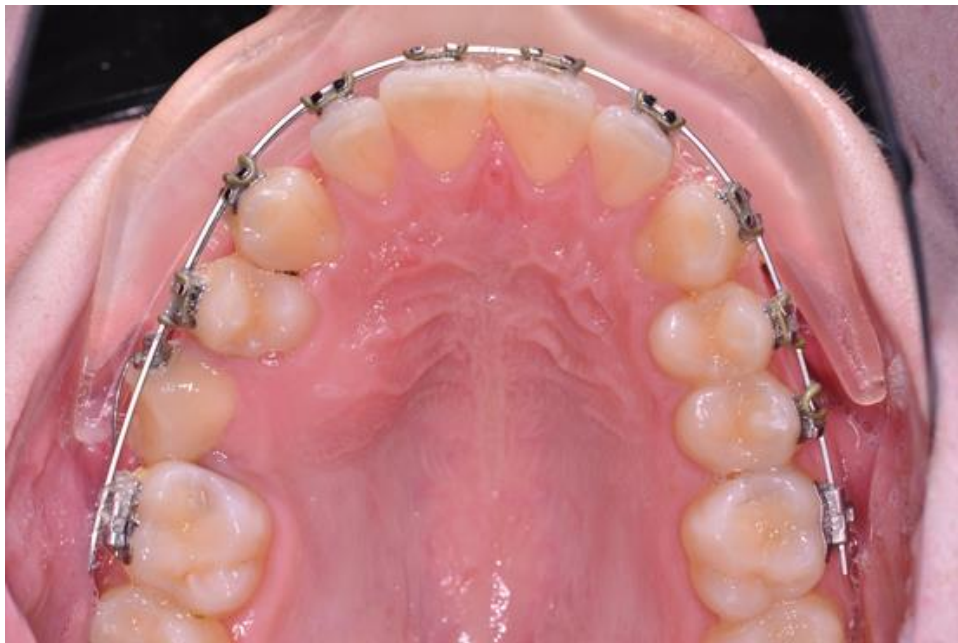


Figure 11 – OPT radiograph of a near horizontally impacted upper right second premolar before it was uprighted to bring it into the line of the arch





Figures 12a and 12b – The same upper second premolar illustrated in the OPG in Figure 11. Notice how, following traction, it still appears to be horizontal in orientation and how brackets have also been bonded palatally in an attempt to align the tooth.

Conclusion

This paper presents a summary of second premolar eruption, and highlights some of the potential clinical outcomes when this eruptive process is disturbed. It reinforces to clinicians the vigilance that should be taken when carrying out clinical and radiographic examination of young patients, with the aim of identifying potential aberrant second premolars at an early stage so that appropriate treatment decisions can be made.

Acknowledgements

The authors would like to thank Mrs Karen Drage (Consultant Orthodontist, Derriford Hospital, Plymouth) for the use of some of her clinical cases in this report.

1. Khalaf K, Miskelly J, Voge E, Macfarlane TV. Prevalence of hypodontia and associated factors: a systematic review and meta-analysis. *J Orthod.* 2014;41(4):299-316.
2. Kramer RM, Williams AC. The incidence of impacted teeth. A survey at Harlem hospital. *Oral surgery, oral medicine, and oral pathology.* 1970;29(2):237-41.
3. Bjerklin K, Bennett J. The long-term survival of lower second primary molars in subjects with agenesis of the premolars. *Eur J Orthod.* 2000;22(3):245-55.
4. Bjerklin K, Al-Najjar M, Karestedt H, Andren A. Agenesis of mandibular second premolars with retained primary molars: a longitudinal radiographic study of 99 subjects from 12 years of age to adulthood. *Eur J Orthod.* 2008;30(3):254-61.
5. Thilander H, Thilander B, Persson G. Treatment of impacted teeth by surgical exposure. A survey study. *Svensk tandlakare tidskrift Swedish dental journal.* 1973;66(6):519-25.
6. Ericson S, Kurol J. Resorption of maxillary lateral incisors caused by ectopic eruption of the canines: A clinical and radiographic analysis of predisposing factors. *American Journal of Orthodontics and Dentofacial Orthopedics.* 1988;94(6):503-13.
7. Ericson S, Kurol J. Resorption of Incisors After Ectopic Eruption of Maxillary Canines: A CT Study. *The Angle Orthodontist.* 2000;70(6):415-23.
8. Algerban A, Jacobs R, Lambrechts P, Loozen G, Willems G. Root resorption of the maxillary lateral incisor caused by impacted canine: a literature review. *Clinical oral investigations.* 2009;13(3):247-55.
9. Howard RD. Impacted Tooth Position: Unexpected Improvements. *British journal of orthodontics.* 1978;5(2):87-92.
10. Tracey C, Lee RT. Root resorption: the aggressive, unerupted second premolar. *British journal of orthodontics.* 1985;12(2):97-101.
11. Tabiat-Pour S, Newlyn A. Root resorption of a maxillary permanent first molar by an impacted second premolar. *British dental journal.* 2007;202(5):261-2.
12. Matteson SR, KANTOR ML, Proffit WR. Extreme distal migration of the mandibular second bicuspid: A variant of eruption. *The Angle Orthodontist.* 1982;52(1):11-8.
13. Sutton PRN. Migrating nonerupted mandibular premolars: A case of migration into the coronoid process. *Oral Surgery, Oral Medicine, Oral Pathology.* 1968;25(1):87-98.
14. Orton HS, McDonald F. The eruptive potential of teeth: a case report of a wandering lower second premolar. *Eur J Orthod.* 1986;8(4):242-6.
15. Infante-Cossio P, Hernandez-Guisado JM, Gutierrez-Perez JL. Removal of a premolar with extreme distal migration by sagittal osteotomy of the mandibular ramus: Report of case. *Journal of Oral and Maxillofacial Surgery.* 2000;58(5):575-7.
16. Okada H, Miyake S, Toyama K, Yamamoto H. Intraosseous tooth migration of impacted mandibular premolar: computed tomography observation of 2 cases of migration

into the mandibular neck and the coronoid process. Journal of oral and maxillofacial surgery. 2002;60(6):686-9.

17. Fuziy A, L. F. Costa A, M. Pastori C, F. de Freitas C, C. Torres F, L. V. Pedrão L. Sequential imaging of an impacted mandibular second premolar migrated from angle to condyle. Journal of oral science. 2014;56(4):303-6.